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(57) Abstract

The present invention provides an apparatus for surface cleaning, in which a first liquid, which includes an oxidizing agent, and a second liquid, which includes a builder or a chelating agent, are initially maintained separately. The apparatus is constructed to facilitate delivery of these two liquids such that they are combined to form an admixture during delivery to a surface to be treated. Either or both of the first and second liquids include a pH-adjusting agent, which is present in an amount such that when the liquids are so delivered, the resulting admixture is maintained at a pH sufficient for cleaning efficacy and stability of the oxidizing agent. The present invention also provides a composition produced by a process of maintaining the two above-mentioned liquids separately and forming an admixture thereof during delivery to a surface to be treated.

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COMPOSITION AND APPARATUS FOR SURFACE CLEANING

Field of the Invention

The present invention relates generally to a bleaching or cleaning composition and more particularly to a liquid composition which includes an oxidizing agent and is useful for treating surfaces. The present invention also relates to an apparatus for delivery of the composition.

Background of the Invention

Liquid cleaning compositions which include an oxidizing agent for bleaching or cleaning a discolored or unclean surface are known. See Scialla *et al.*, European Publication No. 0 598 973 A1, published June 1, 1994. Such liquid cleaning compositions are typically prepared by combining the oxidizing agent and the remaining ingredients of the cleaner and mixing or blending the combination to form a homogeneous composition appropriate for application to the surface to be treated.

However, most of the liquid cleaners prepared in this manner have proved to be deficient in terms of the stability or the bleaching or cleaning efficacy of the oxidizing agent. For example, Scialla *et al.* (above) discloses that an exemplary formulation of its blended composition, which includes hydrogen peroxide, is stable for only a limited period of two weeks. Thus,

the formulation would have to be used within this limited period for maximum brightening efficacy.

Attempts have been made to address the lack of bleaching or cleaning efficacy or stability of the oxidizing agent in specific liquid cleaners. For example, attempts have been made to address the recognized stability problems concerning bleaching compositions which employ persalt or peroxide solutions as oxidizing agents, many of which are used for laundering applications. See Evans, U.S. Patent No. 3,741,903, filed December 8, 1971 and issued June 26, 1973.

In one laundering application, La Barge et al. disclose a bleaching composition in which a solid inorganic peroxygen compound is dispersed in a solution of a carboxylic acid anhydride in an essentially anhydrous, water-dispersible organic material. La Barge et al., U.S. Patent No. 3,660,295, filed April 27, 1970 and issued May 2, 1972. The peroxygen compound and the anhydride would normally interact prematurely, causing instability; however, as the components in the dispersion do not interact appreciably, the bleaching dispersion is said to be relatively stable. Alternatively, La Barge et al. disclose that the components may be separately contained in a multi-chambered package from which they are poured prior to mixing in the presence of water to form a bleaching bath.

In another laundering application, Arnau-Munoz et al. disclose a container having compartments which separately receive the mutually incompatible constituents of a detergent composition, such as constituents which release active oxygen or chlorine and constituents which make up the remainder of the detergent composition. Arnau-Munoz et al., U.S. Patent No. 4,835,804, filed March 25, 1988 and issued June 6, 1989. Each of the compartments has openings which permit diffusion of

its contents into a washing machine during the washing process.

The prior art fails to provide an effective means of delivering a liquid cleaner, including any of a variety of possible oxidizing agents, such that the oxidizing agent thereof is stable and effective as a bleaching or cleaning agent when so delivered to a surface to be treated.

Summary of the Invention

It is an object of the present invention to provide a bleaching or cleaning composition which includes an oxidizing agent, wherein the composition provides an environment appropriate for maintaining cleaning efficacy or stability of the oxidizing agent.

It is a further object of the invention to provide an apparatus for convenient and effective delivery of such a composition to a surface to be treated.

These and other objects are achieved by the present invention which provides a bleaching or cleaning composition which includes an oxidizing agent, wherein the composition provides an environment sufficient for maintaining a cleaning efficacy or stability of the oxidizing agent upon delivery to a surface to be treated. The composition is produced in such a way that the cleaning efficacy or stability of the oxidizing agent is effectively maintained prior to use, such as during storage, as well as upon use, such as upon spraying or other delivery of the composition to a surface to be treated.

More specifically, the composition is a product of two liquids which are separately maintained prior to forming an admixture during delivery to a surface to be treated, whereupon the pH of the admixture

is maintained at a level sufficient for such cleaning efficacy and stability. One liquid includes an oxidizing agent and the other liquid includes a builder or chelating agent. As the two liquids are initially separated, the oxidizing agent can be maintained in an environment free of the builder or chelating agent and otherwise conducive to its cleaning activity and stability up to the time of use.

In the present invention, either or both of the liquids includes a pH-adjusting agent. The pH-adjusting agent is present in an amount such that when the liquids form an admixture during delivery to a surface, the admixture is maintained at a pH sufficient for cleaning efficacy and stability of the oxidizing agent. Thus, when the initially separated liquids are allowed to interact, the resulting liquid cleaning composition being delivered to the surface will have the cleaning or bleaching activity and stability appropriate for the cleaning or bleaching of that surface.

The present invention also relates to an apparatus which maintains the two liquids separately until delivery and provides for such delivery, during which the pH-maintained admixture is formed and delivered to a surface to be treated. The apparatus includes one compartment for the liquid which includes the oxidizing agent and another compartment for the liquid which includes the builder or chelating agent. Either or both of these two compartments may contain the pH-adjusting agent which, collectively, is present in an amount sufficient for cleaning efficacy and stability of the admixture of the two liquids, as described above. According to one aspect of the invention, the apparatus may have separate delivery channels for the two liquid components for delivering the two liquids, whereupon the admixture is formed. These delivery channels may be

constructed to provide for the contemporaneous delivery of the two liquids to the exterior of the apparatus, whereupon the two liquids meet to form the admixture. Alternately, the separate delivery channels may communicate with an admixing space in which the two liquids form the admixture and from which the admixture is delivered to the exterior of the apparatus.

In the present invention, a variety of oxidizing agents may be used. For example, the oxidizing agent may be a peroxide or peroxide-generator, such as hydrogen peroxide, or a peracid or persalt, including both organic and inorganic peracids and persalts, such as peracetic acid and monoperoxysulfate, respectively. Further, as disclosed in Application Serial No. __/___, __ to Choy et al., filed concurrently herewith, the oxidizing agent may be a hypohalite or hypohalite generator, such as a hypochlorite. Accordingly, Application Serial No. __/____,____ to Choy et al. is incorporated herein in its entirety by this reference.

Additionally, a variety of builders or chelating agents, pH-adjusting agents, and other additives may be used in the present invention. These components may be maintained initially with either or both of the separated liquid components, as convenient, desired, or necessary for compatibility or other purposes.

The oxidizing agent, builder or chelating agent, and the pH-adjusting agent are preferably chosen to provide a composition which is useful for removing mildew or soap scum from a surface, such as wall or floor tile. Additionally, the apparatus for delivering the composition preferably facilitates spray delivery of the composition to the surface.

Additional objects, advantages and features of the various aspects of the present invention will become

apparent from the following description of its preferred embodiments, which description should be taken in conjunction with the accompanying drawings.

Brief Description of the Drawings

Figure 1 is a cross-sectional illustration of the apparatus according to an embodiment of the present invention.

Figure 2 is a cross-sectional illustration of the apparatus according to another embodiment of the present invention.

Description of Preferred Embodiments

In the present invention, it has been discovered that a liquid cleaning or bleaching composition which includes an oxidizing agent, a builder or chelating agent, and a pH-adjusting agent, can be formulated and delivered in such a way as to improve the cleaning or bleaching efficacy and stability of the oxidizing agent component. The formulated liquid composition is thus particularly effective in the cleaning or bleaching of a surface. Further, as demonstrated in the examples herein, the formulated liquid composition is especially effective in the cleaning or bleaching of a surface having mildew or soap-scum deposits thereon, such as kitchen or bathroom tile.

While the term "cleaning" typically refers to the removal of soils without use of an oxidizing agent and the term "bleaching" typically refers to the removal of stains using an oxidizing agent, these terms are used to be generally interchangeable for convenience, unless implicitly, obviously, or specifically rendered otherwise.

According to the present invention, individual components of the composition which may be subject to

deactivation or destabilization prior to or during formulation of the composition, are protected from deactivation and destabilization. More particularly, prior to such formulation, these components are maintained separately from deactivating and destabilizing environments. Additionally, these components are protected from deactivation and destabilization during the formulation of the composition.

Figure 1 is an illustration of the apparatus 10 of the present invention which maintains two liquids 14 and 18 separately and facilitates formulation and delivery of an admixture 32 thereof for application to a surface 34 to be treated. The apparatus 10 may be divided by a divider 36, such as a wall, into a compartment 12 which contains liquid 14 and another compartment 16 which contains liquid 18. Either or both of liquids 14 and 18 may include one or more components of the composition which might otherwise be subject to a deactivating or destabilizing influence or environment. Each liquid is maintained in its compartment in an environment conducive to a desired level of activity or stability for such components. By way of example, the environment may be one consistent with a pH level or range conducive to the cleaning or bleaching activity or stability of an oxidizing agent component.

While the present invention is described in terms of two compartments which separate two liquid components, it will be understood that additional compartments may be used when it is desirable to maintain additional components separately for compatibility or other purposes. It will also be understood that the apparatus 10 may comprise stand-alone compartments that may be joined together to facilitate the formulation of an admixture of the various components

and delivery of the admixture to a surface to be treated.

According to the present invention, one of the liquids, arbitrarily "first" liquid 14, includes an oxidizing agent. The other of the liquids, arbitrarily "second" liquid 18, includes a builder or a chelating agent. (As used herein, the terms builder or chelating agent are interchangeable, unless implicitly, obviously, or specifically rendered otherwise.)

A variety of oxidizing agents, such as the peroxides or peroxide generators discussed herein, are known to be pH-sensitive and may become destabilized or ineffective as cleaning or bleaching agents at certain pHs. Such peroxide oxidizing agents are also known to react with cleaning additives, such as bleach activators, often resulting in cleaning compositions which are unstable during storage. In the present invention, the first liquid 14 which includes such an oxidizing agent, may be maintained in an environment, such as at a preselected pH, that is conducive to a desired level of cleaning activity and stability for that oxidizing agent. Further, the first liquid 14 is initially maintained separately from the second liquid 18, which includes a builder and may include peroxide-destabilizing additives, to protect the oxidizing agent from destabilization.

According to the present invention, either one or both of the first and second liquids 14 and 18 includes a pH-adjusting agent. The pH-adjusting agent is present in an amount sufficient to maintain an admixture of the oxidizing agent and the builder at a pH sufficient for cleaning efficacy and stability of the oxidizing agent. Thus, in cases in which the admixing of the oxidizing agent and the builder components would result in a pH which is not conducive to the cleaning efficacy or stability of the oxidizing agent, the pH-

adjusting agent protects against such an undesirable condition.

The apparatus 10 of the present invention is of a construction sufficient to deliver the first liquid 14 and the second liquid 18 from compartment 12 and compartment 16, respectively, to form an admixture 32 of the first and second liquids. Thus, the liquids are maintained separately until delivery is desired.

By way of example, the apparatus 10 may include a first delivery channel 20 and a second delivery channel 22 leading from compartment 12 and compartment 16, respectively, to a delivery activator 24. Preferably, the first and second channels 20 and 22 are completely separate to prevent contamination of the first and second compartments subsequent to use. In this manner, after use, any of the first liquid 14 remaining in the first channel flows back into the first compartment 12, while any of the second liquid 18 remaining in the second channel flows back into the second compartment 16.

The delivery activator 24 may be a pump dispenser (as shown), a trigger sprayer, or the like, which are appropriate for delivery of the two liquids to a location at which the two liquids meet to form an admixture 32. Such a location may be a point 28, external to the apparatus, at which two streams, one for each liquid, intersect to form the admixture 32 during their contemporaneous delivery from the apparatus. Alternately, as shown in Figure 2, the location may be an admixing space 30, such as a chamber, to which the two liquids are delivered and in which the admixture 32 is allowed to form before its delivery to an exterior of the apparatus. In the latter embodiment, the admixing space may have a preselected volumetric capacity so that only a small volume of admixture may reside therein

subsequent to use. For example, the admixing space may have a capacity for about 1.0 milliliter or less of the admixture.

Preferably, the delivery activator 24 is a pump dispenser or a trigger sprayer sufficient for spraying of the two liquids to the intersection point 28 and of the resulting admixture 32 to the surface 34 to be treated (Figure 1), or of the admixture 32 from admixing space 30 to the surface 34 (Figure 2). When the delivery activator 24 is a pump dispenser, delivery may be accomplished by depressing the activator in a downward direction which is represented by arrow 26. Preferably, the apparatus can be single-handedly manipulated, such as by holding the apparatus in one hand while depressing the delivery activator with one or more fingers or a thumb of the same hand. When the delivery activator is a trigger sprayer (not shown), delivery may be accomplished by holding a neck of the dispenser apparatus in the cup of one hand while pulling the trigger activator inwardly with respect to the neck with one or more fingers of the same hand, as is well known.

Preferably, the delivery activator includes a closing mechanism (not shown) to prevent undesired, post-use delivery, such as during a child's meddling with the apparatus, or undesirable dripping or shooting of liquid from the apparatus. Regarding the first two of these potential undesirable events, a child-proof and/or a conventional, drip-preventing closing mechanism may be employed. Many such mechanisms are known and employed commercially.

Regarding the undesirable shooting of liquid from many conventional dispensing systems, it appears that this shooting occurs when gas is produced by the contents of the dispenser and allowed to accumulate in

the closed dispenser. When the closing mechanism is moved from a closed to an open position, accumulated gas pressure can cause the shooting of liquid from the dispenser.

This occurrence is reduced or avoided in the present invention, as the two liquids which might otherwise produce gas, are separated prior to delivery. Additionally, in the embodiment of Figure 1, these two liquids interact only upon delivery to an exterior to the apparatus, so that any gas that might be produced by the admixture of these two liquids is not produced in the apparatus interior. Further, in the embodiment of Figure 2, the admixing space 30 is preferably limited in volumetric capacity so that only a small amount of the admixture may be formed upon delivery of the two liquids thereto and thus, possibly remains therein after use. This volumetric capacity may be selected such that only a small or insignificant amount (in terms of possible gas production) of the admixture may remain in the admixing space after use, such that little, if any, gas is produced or accumulated. Thus, according to the embodiment of Figure 2, shooting of liquid may be eliminated or reduced in occurrence or effect (i.e., the shooting force and the distance of travel and amount of the shooting liquid). According to either of these embodiments, after delivery, liquid in either of the separate delivery channels returns to its original compartment where it does not interact with the other separately compartmentalized liquid. This further eliminates or reduces the potential for gas production from the admixing of the two liquids.

Other delivery activators may be chosen to accommodate various delivery arrangements or applications, such as delivery to hard-to-reach surfaces. Further, while the surface 34 is shown as a vertical

surface, such as a wall, it will be understood that the surface may be oriented otherwise, such as at an angle or horizontally, or may be the surface of a mop, sponge, cloth, or the like, which will be used in a cleaning application.

The apparatus 10 will be understood further in terms of the following description of a composition which is produced by a process, according to the present invention. The composition 32, which is useful for bleaching or cleaning a surface 34, is produced by a process of maintaining a first liquid 14 and a second liquid 18 separately and forming an admixture 32 thereof during delivery to a surface 34. As described above, the first liquid 14 includes an oxidizing agent, the second liquid 18 includes a builder or a chelating agent, and at least one of the first and second liquids includes a pH-adjusting agent. The pH-adjusting agent is present in an amount such that the admixture 32 is maintained at a pH sufficient for cleaning efficacy and stability of the oxidizing agent.

Oxidizing Agents

The oxidizing agent which is included in the first liquid 14 is now described. In the present invention, the oxidizing agent is present in an amount ranging from about 0.1 to about 50 weight percent of the first liquid. Generally, the amount of oxidizing agent is preferably from about 1 to about 20 weight percent of the first liquid and more preferably from about 5 to about 10 weight percent of the first liquid.

According to one embodiment, the oxidizing agent is a peroxygen bleach, such as a peroxide or a peroxide generator capable of generating peroxide bleaching species. Hereafter, the term "peroxide" is used to describe both a peroxide and a peroxide genera-

tor, unless otherwise indicated. Preferably, the peroxide oxidizing agent is hydrogen peroxide or a hydrogen peroxide generator, hydrogen peroxide being the more preferred. The peroxide generator is a source of peroxide, for example, in the case of a hydrogen peroxide generator, the source of hydrogen peroxide may be selected from the alkali metal salts of percarbonate, perborate, persilicate and hydrogen peroxide adducts and hydrogen peroxide. Most preferred sources are sodium percarbonate, sodium perborate mono- and tetrahydrate, and hydrogen peroxide.

According to another embodiment, the oxidizing agent is a peroxygen bleach, such as a peracid, a persalt, or a peracid or persalt generator capable of generating peracid or persalt bleaching species, respectively. Hereafter, the term "peracid" is used to describe both a peracid and a peracid generator, unless otherwise indicated. Further, the term "persalt" is used to describe both a persalt and a persalt generator, unless otherwise indicated. The peracid or persalt generator is a source of peracid or persalt, respectively, for example, in the case of a persalt generator, the source of persalt may be selected from monopersulfates and monoperphosphates.

The peracid or persalt may be organic or inorganic. By way of example, the peracid may be an organic peracid, such as peracetic acid or percarboxylic acid. Further by way of example, the persalt may be an inorganic persalt, such as peroxymonosulfate or an alkali metal peroxymonosulfate, such as potassium, lithium or sodium peroxymonosulfate. A suitable persalt is potassium peroxymonosulfate ($KHSO_5$), such as that available as a mixed salt ($2\ KHSO_5 \cdot KHSO_4 \cdot K_2SO_4$) from E.I. DuPont DeNemours and Company, Inc. under the name "OXONE". Further suitable peracids and persalts include

peroxyglycollic acid, peroxylactic acid, peroxycitric acid, peroxynonanoic acid, monomethyl perglutaric acid, diperoxydodecanoic acid, magnesium monoperoxyphthalate hexahydrate, such as that commercially available from Solvay Interox of Houston, Texas under the name H48, trimellitic peracid and derivatives thereof, peroxycarboxycaproic acid derivatives, amide peracid derivatives, imide peracid derivatives, perborates, percarbonates, and peroxydisulfates and salts thereof, such as $-(NH_4)_2S_2O_8$, $K_2S_2O_8$, and $Na_2S_2O_8$.

Builder or Chelating Agents

The builder or chelating agent which is included in the second liquid 18 is now described. In the present invention, the builder is present in an amount ranging from about 0.1 to about 30 weight percent of the second liquid. The amount of builder is preferably from about 1 to about 20 weight percent of the second liquid and more preferably from about 5 to about 15 weight percent of the second liquid.

According to the present invention, suitable builders may be selected from the group consisting of a carbonate, a phosphate, a pyrophosphate, an amino carboxylate, a polycarboxylate, a polyacrylate, a phosphonate, an amino phosphonate, a polyphosphonate, a salt thereof, and a mixture thereof. Suitable builders include ethylenediaminetetraacetic acid ("EDTA"), tartaric acid, citric acid, nitrilotriacetic acid ("NTA"), sodi carboxymethylsuccinic acid, sodium N-(2-hydroxyprop)-iminodiacetic acid, (N-hydroxyethyl)et..ylenediaminetriacetic acid ("HEDTA"), N-diethyleneglycol-N,N-diacetic acid ("DIDA"), diethylenetriaminepentaacetic acid ("DTPA"), a salt thereof, and a mixture thereof. Suitable polyacrylate builders are commercial available, for example, from Rohm &

Haas of Philadelphia, Pennsylvania under the name ACUSOL and from BASF of Parsippany, New Jersey under the name SOKALAN. Further, suitable chelating agents may be selected from the group consisting of a gluconic acid, a salt thereof, and a mixture thereof. Such chelating agents are commercially available, for example, as PMP Sodium Gluconate from PMP Fermentation Products of Rosemont, Illinois. The salts are preferably compatible and include ammonium, sodium, potassium, and alkanol-ammonium salts.

A preferred builder is NTA, such as sodium salt of NTA. A more preferred builder is citrate, such as sodium or monoethanolamine salt of citrate. An even more preferred builder is tartaric acid. Most preferably, the builder is EDTA, such as a sodium salt of EDTA.

pH-Adjusting Agents

The pH-adjusting agent which is present in either one or both of the two liquids 14 and 18 is now described. According to the present invention, the pH-adjusting agent maintains the pH of the admixture of the two liquids such that the oxidizing agent is sufficiently stable and efficacious as a cleaning active. As used herein, the term "pH-adjusting agent" includes an agent which may act to adjust the pH of the admixture as well as a buffer which may act to maintain the pH of the admixture.

Preferably, the pH-adjusting agent is selected from the group consisting of a hydroxide, a hydroxide generator, a buffer, and a mixture of same. Appropriate pH-adjusting agents include alkali metal salts of various inorganic acids, such as alkali metal phosphates, polyphosphates, pyrophosphates, triphosphates, tetraphosphates, silicates, metasilicates, polysilicates, borates, carbonates, bicarbonates, hydrox-

ides, and mixtures of same. A preferred pH-adjusting agent is an alkali metal hydroxide, especially sodium hydroxide.

Also suitable as pH-adjusting agents are monoethanolamine compounds, such as diethanolamine and triethanolamine, and beta-aminoalkanol compounds, particularly beta-aminoalkanols having a primary hydroxyl group, and a mixture thereof. Suitable amine compounds should exhibit reasonable solubility relative to the admixture.

In the present invention, the admixture is maintained at a pH which is appropriate for cleaning activity and stability of the oxidizing agent. When the oxidizing agent is a peroxide, the admixture pH is alkaline. For example, when a peroxide oxidizing agent is used, the pH of the admixture is preferably maintained from above about 9.0 to about 11.5. When the admixture pH is above about 9.0, the peroxide shows sufficient bleaching efficacy. The peroxide is also sufficiently stable when this admixture pH is maintained below about 11.5.

When the oxidizing agent is a peracid or a persalt, the admixture pH may be acidic, neutral, or slightly alkaline. For example, in the peracid or persalt embodiment, the pH of the admixture is preferably maintained between about 3.5 and about 7.5.

According to the present invention, the amount of pH-adjusting agent is present in one or both of the first and second liquids in an aggregate amount sufficient to adjust the pH of the admixture to the desired level, as described above. By way of example, the pH-adjusting agent may be present in an amount between about 0.1 and about 30 weight percent of one of the liquids or in an amount between about 0.05 and about 15 weight percent of the admixture. Preferably, the pH-

adjusting agent is present in an amount between about 0.1 and about 20 weight percent of one of the liquids or in an amount between about 0.05 and about 10 weight percent of the admixture.

Additives

The composition of the present invention can be formulated to include additives, such as fragrances, coloring agents, whiteners, thickening agents, chelating agents and builders, solvents, surfactants, and disinfectants, and the like, which enhance performance, stability or aesthetic appeal of the compositions. Such components can be included in either one or both of the two liquids 14 and 18, according to compatibility, desirability, convenience, or other factors. Generally, all of these additives are also selected with the characteristic of being resistant to the oxidizing agent employed.

Fragrances, such as those commercially available from International Flavors and Fragrance, Inc., may be included in any of the compositions produced according to the embodiments described herein.

Suitable fragrances may take the form of fragrance oils. A fragrance or mixture of fragrances may be present in an amount of from about 0.01 to about 2.0 weight percent of the composition. Preferably, a fragrance or mixture of fragrances is present in am amount from about 0.1 to about 1 weight percent of the composition.

In embodiments wherein the oxidizing agent is a peroxygen bleach, such as peroxide, fragrance additives are preferably included in the first liquid 14 which includes the oxidizing agent and is preferably maintained at a pH appropriate for fragrance stability. When the fragrance is included in the first liquid 14,

it is preferable to include the pH-adjusting agent in the second liquid 18, so as not to interfere with fragrance stability. By way of example, in the peroxygen embodiment, the first liquid 14 may have a pH of about 7 which is suitable for the peroxygen and the stability of certain fragrances. In this example, as the fragrance is maintained separately from the second liquid 18, the second liquid 18 which includes the pH-adjusting agent may be quite caustic without interfering with the stability of the separately compartmentalized fragrance.

On the other hand, in embodiments wherein the oxidizing agent is a peracid or persalt, the fragrances are preferably included in the second liquid 18 which includes the builder and is preferably maintained at a pH appropriate for fragrance stability. When the fragrance is included in the second liquid 18, it is preferable to include the pH-adjusting agent in the first liquid 14 which includes the oxidizing agent, so as not to interfere with fragrance stability.

Dyes and pigments may be included in small amounts. Ultramarine Blue (UMB) and copper phthalocyanines are examples of widely used pigments which may be incorporated in the compositions produced according to the present invention.

Suitable builders, as also discussed above, may be optionally included in the composition. Such builders include but are not limited to carbonates, phosphates and pyrophosphates, which are known to reduce the concentration of free alkali metal ions in aqueous solution. Certain suitable pH-adjusting agents, such as carbonates, phosphates, phosphonates, polyacrylates and pyrophosphates also function as builders. Typical builders which do not also function as pH-adjusting agents include sodium and potassium tripolyphosphate and

sodium or potassium hexametaphosphate. These builders may also function as electrolytes.

Various solvents, surfactants, and disinfectants may also be included in the composition. For example, suitable solvents include alcohols, glycols and glycoethers. Glycols and glycoether solvents are preferred as generally being less odorous, less volatile and more compatible with other cleaning components than are alcohol solvents. Diethyleneglycol and ethyleneglycol *n*-butyl ether are preferred, the former being the more preferred.

Further by way of example, suitable solvents for use herein include propylene glycol t-butyl ether and propylene glycol n-butyl ether, which readily improve non-streaking/non-filming performance of the composition. If mixtures of solvents are used, the amounts and ratios of such solvents used are important in determining the optimum cleaning and streak/film performances of the inventive composition. It is preferred to limit the total amount of solvent to no more than 50 weight percent, more preferably no more than 25 weight percent, and most preferably, no more than 15 weight percent, of the composition. A preferred range for the total amount of solvent is about 1-15 weight percent of the composition, although in some of the compositions of this invention, solvent may be omitted. If a mixed solvent system of alkanol/glycol ether is used, the ratio of alkanol to alkylene glycol ether should be about 1:20 to 20:1, more preferably about 1:10 to 1:10, and most preferably about 1:5 to 5:1.

Other, less water soluble or dispersible organic solvents may also be used herein, although in a high water formulation, there may be a need for a further dispersant (e.g., hydrotrope or other emulsi-

fier). These less water soluble or dispersible organic solvents include those commonly used as constituents for proprietary fragrance blends, such as terpene derivatives. The terpene derivatives herein include terpene hydrocarbons with a functional group. Effective terpenes with a functional group include, but are not limited to, alcohols, ethers, esters, aldehydes and ketones.

Representative examples for each of the above classes of terpenes with functional groups include but are not limited to the following: (1) terpene alcohols, including, for example, verbenol, transpinocarveol, cis-2-pinanol, nopol, iso-borneol, carbeol, piperitol, thymol, -terpineol, terpinen-4-ol, menthol, 1,8-terpin, dihydro-terpineol, nerol, geraniol, linalool, citronellol, hydroxycitronellol, 3,7-dimethyl octanol, dihydromyrcenol, -terpineol, tetrahydro-alloocimenol and perillalcohol; (2) terpene ethers and esters, including, for example, 1,8-cineole, 1,4-cineole, isobornyl methylether, rose pyran, -terpinyl methyl ether, menthofuran, trans-anethole, methyl chavicol, allocimene diepoxide, limonene mono-epoxide, iso-bornyl acetate, nopyl acetate, -terpinyl acetate, linalyl acetate, geranyl acetate, citronellyl acetate, dihydro-terpinyl acetate and neryl acetate; and (3) terpene aldehydes and ketones, including, for example, myrtenal, campholenic aldehyde, perillaldehyde, citronellal, citral, hydroxy citronellal, camphor, verbenone, carvenone, dihyrocarvone, carvone, piperitone, menthone, geranyl acetone, pseudo-ionone, -ionone, -ionone, iso-pseudo-methyl ionone, normal-pseudo-methyl ionone, iso-methyl ionone and normal-methyl ionone. Terpene hydrocarbons with functional groups which appear suitable for use in the present invention are discussed in substantially greater detail by Simonsen and Ross, The Terpenes, Volumes I-V,

Cambridge University Press, 2nd Ed., 1947 (incorporated herein by reference thereto). See also, the commonly assigned U.S. Patent 5,279,758, of Choy, incorporated herein in its entirety by this reference.

Further by way of example, suitable surfactants include cosurfactants which are added to the composition for various purposes (such as cleaning, stability, thickening, *etc.*) which may be selected initially on the basis of cleaning ability. The surfactants may be also selected on the basis of moderate to high stability in the presence of bleach, although such stability is not necessary given that the surfactants may be compartmentalized separately from bleaching agents in the present invention.

Generally, a wide variety of surfactants may be stable in the presence of bleaches in an aqueous solution, including but not limited to amine oxides, betaines, sarcosinates, taurates, alkyl sulfates, alkyl sulfonates, alkyl aryl sulfonates, alkyl phenol ether sulfates, alkyl diphenyl oxide sulfonates, alkyl phosphate esters, *etc.* Generally, such cosurfactants may be any of a variety of different types including anionics, non-ionics, amphoterics, *etc.*

For example, lauroyl sarcosinates are suitable cosurfactants since they are particularly resistant to oxidation by bleach materials. Accordingly, these materials are bleach- resistant, even at elevated temperatures. Hydrotropes such as C_{6-12} alkyl sulfonate, toluene sulfonate, xylene sulfonate, cumene sulfonate and alkyl naphthalene sulfonate salts of alkali metals are also useful. Preferred cosurfactants are C_{6-12} alkyl sulfonate and sodium salt of a C_{6-12} sulfonic acid.

In any event, the specific identity of the cosurfactant is not critical to the present invention as long as the cosurfactant is relatively bleach stable and

compatible with the other components of the composition to perform either bleaching or stabilizing functions.

Suitable disinfectants, which may augment the disinfecting action of the oxidizing agent, include the following: (1) mercury compounds, such as mercuric chloride, phenylmercuric borate; (2) halogens and halogen compounds, such as chlorine, iodine, fluorine, bromine, calcium and sodium hypochlorite; (3) phenols, such as creosol from coal tar and ortho-phenylphenol; (4) synthetic detergents, for example, anionic detergents such as sodium alkyl benzene sulfonates, and cationic detergents such as quaternary ammonium compounds; (5) alcohols, such as alcohols of low molecular weight (excepting methanol); (6) natural products, such as pine oil; and (7) gases, such as sulfur dioxide, formaldehyde, and ethylene oxide.

EXAMPLES

Exemplary embodiments of the inventive composition produced by the process described herein comprise the components which are listed below for Examples 1 and 2. These components are grouped according to their preferred presence in either liquid 14 ("Liquid 1") or liquid 18 ("Liquid 2"). Further, the preferred amount of each component is provided in terms of a range of the weight percent of that component relative to Liquid 1 or Liquid 2 which includes that component.

EXAMPLE 1

Liquid 1:

Component	Weight Percent (%)
Hydrogen Peroxide	0.1 - 15
C_{10-14} Alcohol Ethoxylate (8 moles ethoxylate)	0 - 4
C_{6-12} Alkyl Sulfonate	0 - 4
Fragrance Oil	0 - 2
Water	Remainder

Liquid 2:

Component	Weight Percent (%)
Ethylenediaminetetraacetic acid (EDTA)	1 - 15
Diethyleneglycol or Ethyleneglycol *n*-butyl ether	0 - 15
C_{6-12} Alkyl Sulfonate	1 - 8
C_{10-14} Alcohol Ethoxylate (6 moles ethoxylate)	0 - 5
Sodium Hydroxide	0 - 2
Sodium Carbonate	0 - 6
Sodium Silicate	0 - 6
Fragrance Oil	0 - 2

EXAMPLE 2

Liquid 1:

Component	Weight Percent (%)
Peracetic Acid or Peroxymonosulfate	0.1 - 15
Buffering or Stabilizing Agent	0 - 5
Water	Remainder

Liquid 2:

Component	Weight Percent (%)
Ethylenediaminetetraacetic acid (EDTA)	1 - 15
Diethyleneglycol or Ethyleneglycol *n*-butyl ether	0 - 15
C_{6-12} Alkyl Sulfonate	1 - 8
C_{10-14} Alcohol Ethoxylate (6 moles ethoxylate)	0 - 5
Sodium Hydroxide	0 - 4

In these two examples, diethyleneglycol *n*-butyl ether may be in the form commercially available from Dow Chemical Co. under the name DOWANOL DB. Additionally, the C_{10-14} alcohol ethoxylate may be an ethoxylated linear primary alcohol or an ethoxylated octyl-phenol alcohol which is a surfactant commercially available from Union Carbide of Danbury, Connecticut under the name TRITON X-100. The C_{6-12} alkyl sulfonate may be a sodium salt of a C_{6-12} sulfonic acid.

Peroxide Compositions

In a preferred embodiment comprising a peroxide oxidizing agent, the inventive composition is produced by admixing Liquids 1 and 2 of Example 1, as described herein, wherein the components listed in Table 1, below, are present in the amounts shown therein (in weight percent relative to Liquid 1 or Liquid 2 which includes that component).

Table 1

Component	Weight Percent (%) of Liquid 1 or 2
Hydrogen Peroxide	6.0
Sodium Hydroxide	1.4
EDTA	10.8
Diethyleneglycol *n*-butyl ether	9.0
Sodium salt of a C_{6-12} sulfonic acid	3.75
Ethoxylated C_{10-14} alcohol	2.0
Fragrance Oil	0.5

Peracid Compositions

In alternate preferred embodiments comprising a peracid or persalt oxidizing agent, the inventive composition is produced by admixing Liquids 1 and 2 of Example 2, as described herein, wherein the components listed in Table 2, below, are present in the amounts shown therein (in weight percent relative to Liquid 1 or Liquid 2 which includes that component) and sodium hydroxide is present in an amount sufficient to provide a pH of 10.3 for Liquid 2. One of these alternate embodiments comprises peracetic acid while the other comprises peroxymonosulfate as the oxidizing agent.

Table 2

Component	Weight Percent (%) of Liquid 1 or 2
Peracetic acid* or Peroxymonosulfate*	12 or 1.3
Sodium Hydroxide**	(Adjusted for optimal pH)
EDTA	10.8
Ethyleneglycol *n*-butyl ether	9.0
Sodium salt of a C_{6-12} sulfonic acid	3.75
Ethoxylated C_{10-14} alcohol	2.0

*Alternate components

**Present in an amount sufficient to provide a pH of from about 2 to about 3 for Liquid 1 and a pH of about 10.3 for Liquid 2.

Performance Tests

In experiments conducted to test the performance of the inventive composition, various admixtures 32 were formulated by admixing a first liquid 14 and a second liquid 18, as described herein. These admixtures were then tested to determine their performance in the removal of mildew and soap scum from a soiled tile having an area of three inches squared.

For the mildew performance tests, soiled tiles were prepared by painting them with killed A. Niger mildew and allowing the mildew to dry. For the soap scum performance tests, soiled tiles were prepared by applying a standard one coat of soap scum to the tiles and allowing the soap scum to dry. Each admixture was sprayed onto the soiled tile, as described herein, and then rated by a panel of ten people in terms of the

level of cleaning. The rating scale ranged from one (1) for no cleaning to ten (10) for complete cleaning.

In the performance tests, a concentrated bathroom cleaner (hereinafter, "CBC") was used as the second liquid, which includes a builder. CBC comprises EDTA as the builder, ethyleneglycol *n*-butyl ether, sodium salt of C_{6-12} sulfonic acid, and ethoxylated C_{10-14} alcohol in the amounts of 10.8, 9.0, 3.75, and 2.0 in weight percent of the second liquid and is present in the compositions shown in Tables 1 and 2.

Performance of Peroxygen Compositions

In the performance tests for peroxygen compositions, the three admixtures listed below were tested.

Admixture	Liquid 1 (weight percent)	Liquid 2
1	6% Hydrogen Peroxide	CBC with minimal caustic (pH about 10.2)
2	6% Hydrogen Peroxide	CBC with 0.4%* NaOH (pH about 13.5)
3	6% Hydrogen Peroxide	CBC with 1.4%* NaOH

*in weight percent of Liquid 2.

When Liquids 1 and 2 are sprayed to form the admixtures, the final pHs of Admixtures 1, 2 and 3 are 9.6, 10.4 and 11.3, respectively. The panel ratings for mildew and soap scum performance are shown below.

Admixture	pH	Mildew Performance	Soap Scum Performance
1	9.6	2.5	*
2	10.4	5.2	10
3	11.3	8.3	*

*not tested.

The mildew performance ratings indicate that the inventive composition, including hydrogen peroxide as an oxidizing agent, is effective in the removal of mildew. The ratings are higher for admixtures having a higher pH. This suggests that the hydrogen peroxide, which is believed to be primarily responsible for the removal of mildew, has greater cleaning efficacy at pHs from between about 10.4 to about 11.3.

The soap scum performance ratings indicate that the inventive composition is completely effective in the removal of soap scum. The results show that the EDTA builder, which is believed to be primarily responsible for the removal of soap scum, functions in that capacity in the presence of the hydrogen peroxide oxidizing agent.

Performance of Peracid and Persalt Compositions

In the performance tests for peracid and persalt compositions, the two admixtures listed below were tested.

Admixture	Liquid 1 (weight percent)	Liquid 2
1	12% Peracetic acid	CBC (pH about 10.3)
2	1.3% Peroxymonosulfate	CBC (pH about 10.3)

When Liquids 1 and 2 are sprayed to form the admixtures, the final pHs of Admixtures 1 and 2 are 3.5 and 7.5, respectively. The panel ratings for mildew performance are shown below.

Admixture	pH	Mildew Performance
1	3.5	3.3
2	7.5	9.6

The mildew performance ratings indicate that the inventive composition, including either peracetic acid or peroxymonosulfate as an oxidizing agent, is effective in the removal of mildew. The results also show that either of these peracid oxidizing agents has sufficient cleaning efficacy and stability in the presence of the EDTA builder, when used according to the present invention.

As described above in relation to the inventive apparatus 10 of Figure 2, the first and second liquids described above may be admixed in an admixing space 30. The admixing space may be volumetrically limited so that only a predetermined volume of the admixture is allowed to exist in the admixing space

throughout and after the delivery process. Thus, only the small amount of the admixture in the admixing space may possibly include a compromised oxidizing agent, such as a destabilized peroxide, peracid or persalt. According to this embodiment, the apparatus is capable of delivering an effective bleaching or cleaning composition 32 on the first delivery (*i.e.*, initial spray), as this small amount of potentially compromised admixture will be combined with fresh first and second liquids being delivered to the admixing chamber for admixing prior to delivery to the surface to be treated. According to the embodiment of Figure 1, the apparatus is also capable of delivering an effective bleaching or cleaning composition 32 on the first delivery (*i.e.*, initial spray), as each of the two liquids, either of which may affect the stability or efficacy of the other, are not allowed to interact prior to their admixing, external to the apparatus, during delivery to the surface to be treated.

It is to be understood that while the invention has been described above in conjunction with preferred specific embodiments, the description and examples are intended to illustrate and not to limit the scope of the invention, which is defined by the scope of the appended claims.

It is Claimed:

1. An apparatus for surface cleaning, comprising:

a first compartment having a first liquid disposed therein and a second compartment having a second liquid disposed therein, said first and second compartments separating the first and second liquids, the first liquid including an oxidizing agent which is a peroxygen bleach, the second liquid including a builder or a chelating agent, and at least one of the first and second liquids including a pH-adjusting agent, the pH-adjusting agent in an amount such that when the first and second liquids are delivered from the first and second compartments to form an admixture during delivery to a surface, the admixture is maintained at a pH sufficient for cleaning efficacy and stability of the oxidizing agent.

2. The apparatus of claim 1 wherein the oxidizing agent is selected from a group consisting of a peroxide and a peroxide generator.

3. The apparatus of claim 2 and the pH is from above about 9.0 to about 11.5.

4. The apparatus of claim 1 wherein the oxidizing agent is selected from a group consisting of a peracid, a peracid generator, a persalt, and a persalt generator.

5. The apparatus of claim 4 wherein the oxidizing agent is peracetic acid.

6. The apparatus of claim 4 wherein the oxidizing agent is percarboxylic acid.

7. The apparatus of claim 4 wherein the oxidizing agent is peroxymonosulfate.

8. The apparatus of claim 4 wherein the pH is between about 3.5 and about 7.5.

9. The apparatus of claim 1 wherein the oxidizing agent is in an amount between about 0.1 and about 15 weight percent of the first liquid.

10. The apparatus of claim 1 wherein the builder or the chelating agent is selected from a group consisting of a carbonate, a phosphate, a pyrophosphate, an amino carboxylate, a polycarboxylate, a polyacrylate, a phosphonate, an amino phosphonate, a polyphosphonate, a salt thereof, and a mixture thereof.

11. The apparatus of claim 10 wherein the builder or the chelating agent includes ethylenediaminetetraacetic acid or a salt thereof.

12. The apparatus of claim 1 wherein the builder or the chelating agent is in an amount between about 1 and about 20 weight percent of the second liquid.

13. The apparatus of claim 1 wherein the pH-adjusting agent is selected from a group consisting of a hydroxide, a hydroxide generator, a buffer, and a mixture thereof.

14. The apparatus of claim 13 wherein the pH-adjusting agent is an alkali metal hydroxide.

15. The apparatus of claim 1 wherein the pH-adjusting agent in present in an amount between about 0.05 and about 10 weight percent relative to the admixture.

16. The apparatus of claim 1 wherein the pH-adjusting agent is present in one of the first and second liquids in an amount between about 0.1 and about 20 weight percent of the one liquid.

17. The apparatus of claim 1 wherein at least one of the first and the second liquids includes a fragrance.

18. The apparatus of claim 2 wherein the first liquid includes a fragrance and the pH-adjusting agent is in the second liquid.

19. The apparatus of claim 4 wherein the second liquid includes a fragrance and the pH-adjusting agent is in the first liquid.

20. The apparatus of claim 1 further comprising a first delivery channel for delivery of the first liquid from the first compartment and a second delivery channel for delivery of the second liquid from the second compartment, whereupon delivery of the first and second liquids the admixture is formed.

21. The apparatus of claim 25 wherein the first and second delivery channels are of a construction sufficient to deliver the first and second liquids,

respectively, contemporaneously and externally with respect to the apparatus, whereupon the liquids meet to form the admixture.

22. The apparatus of claim 25 further comprising an admixing space, wherein the first and second delivery channels communicate with the admixing space to deliver the first and second liquids, respectively, thereto, whereupon the liquids form the admixture.

23. The apparatus of claim 27 wherein the admixing space has a capacity for about 1.0 milliliter or less of the admixture.

24. A composition useful for bleaching or cleaning a surface, produced by a process comprising:

maintaining a first liquid and a second liquid separately and forming an admixture thereof during delivery to a surface, the first liquid including an oxidizing agent oxidizing agent which is a peroxygen bleach, the second liquid including a builder or a chelating agent, and at least one of the first and second liquids including a pH-adjusting agent, the pH-adjusting agent in an amount such that the admixture is maintained at a pH sufficient for cleaning efficacy and stability of the oxidizing agent.

25. The composition of claim 24 wherein the oxidizing agent is selected from a group consisting of a peroxide and a peroxide generator.

26. The composition of claim 25 wherein the pH is from above about 9.0 to about 11.5.

27. The composition of claim 24 wherein the oxidizing agent is selected from a group consisting of a peracid, a peracid generator, a persalt, and a persalt generator.

28. The apparatus of claim 27 wherein the oxidizing agent is peracetic acid.

29. The apparatus of claim 27 wherein the oxidizing agent is percarboxylic acid.

30. The apparatus of claim 27 wherein the oxidizing agent is peroxymonosulfate.

31. The apparatus of claim 27 wherein the pH is between about 3.5 and about 7.5.

32. The composition of claim 24 wherein the oxidizing agent is in an amount between about 0.1 and about 15 weight percent of the first liquid.

33. The composition of claim 24 wherein the builder or the chelating agent is selected from a group consisting of a carbonate, a phosphate, a pyrophosphate, an amino carboxylate, a polycarboxylate, a polyacrylate, a phosphonate, an amino phosphonate, a polyphosphonate, a salt thereof, and a mixture thereof.

34. The composition of claim 33 wherein the builder or the chelating agent includes ethylenediamine-tetraacetic acid or a salt thereof.

35. The composition of claim 24 wherein the builder or the chelating agent is in an amount between

about 1 and about 20 weight percent of the second liquid.

36. The composition of claim 24 wherein the pH-adjusting agent is selected from a group consisting of a hydroxide, a hydroxide generator, a buffer, and a mixture thereof.

37. The composition of claim 36 wherein the pH-adjusting agent is an alkali metal hydroxide.

38. The composition of claim 24 wherein the pH-adjusting agent in present in an amount between about 0.05 and about 10 weight percent relative to the admixture.

39. The composition of claim 24 wherein the pH-adjusting agent is present in one of the first and second liquids in an amount between about 0.1 and about 20 weight percent of the one liquid.

40. The composition of claim 24 wherein at least one of the first and the second liquids includes a fragrance.

41. The composition of claim 25 wherein the first liquid includes a fragrance and the pH-adjusting agent is in the second liquid.

42. The composition of claim 27 wherein the second liquid includes a fragrance and the pH-adjusting agent is in the first liquid.

43. The composition of claim 24 wherein said maintaining the first and separate liquids separately

comprises providing a dispenser having a first compartment and a first delivery channel for the first liquid and a second compartment and a second delivery channel for the second liquid, the composition produced by the process further comprising delivering said first and second liquids to form the admixture.

44. The composition of claim 43 wherein the first and second liquids are delivered contemporaneously and externally with respect to the dispenser whereupon the liquids meet to form the admixture.

45. The composition of claim 43 wherein the dispenser includes an admixing space and said delivering comprises delivering the first and second liquids to the admixing space to form the admixture.

46. The composition of claim 45 wherein the admixing space has a capacity for about 1.0 milliliter or less of the admixture.

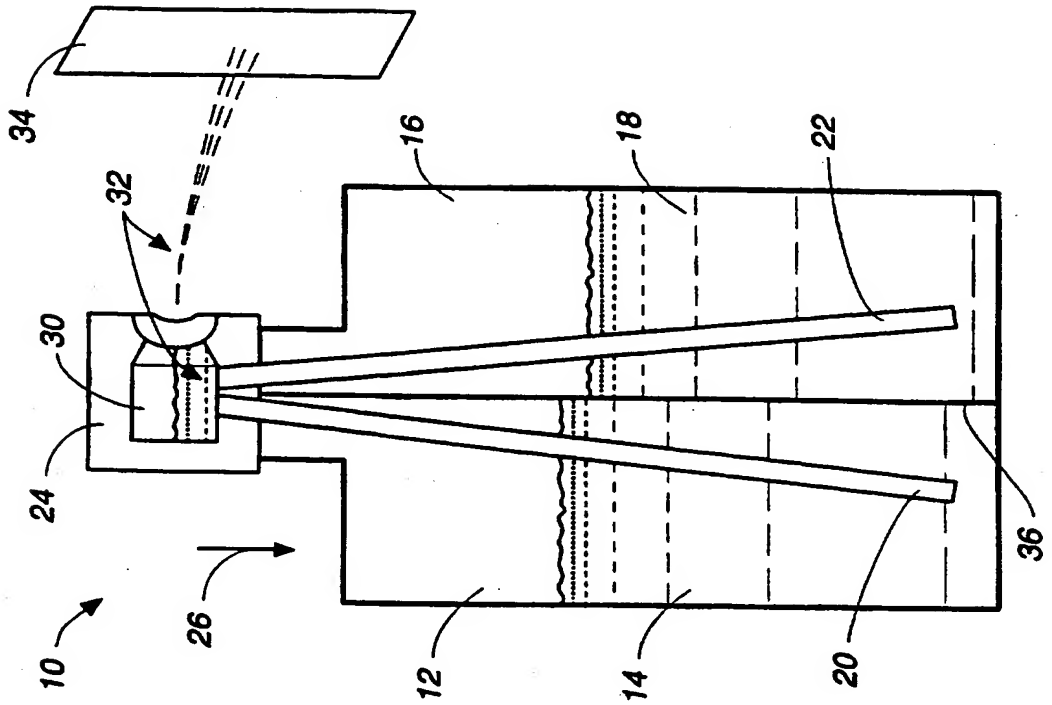

FIG._2

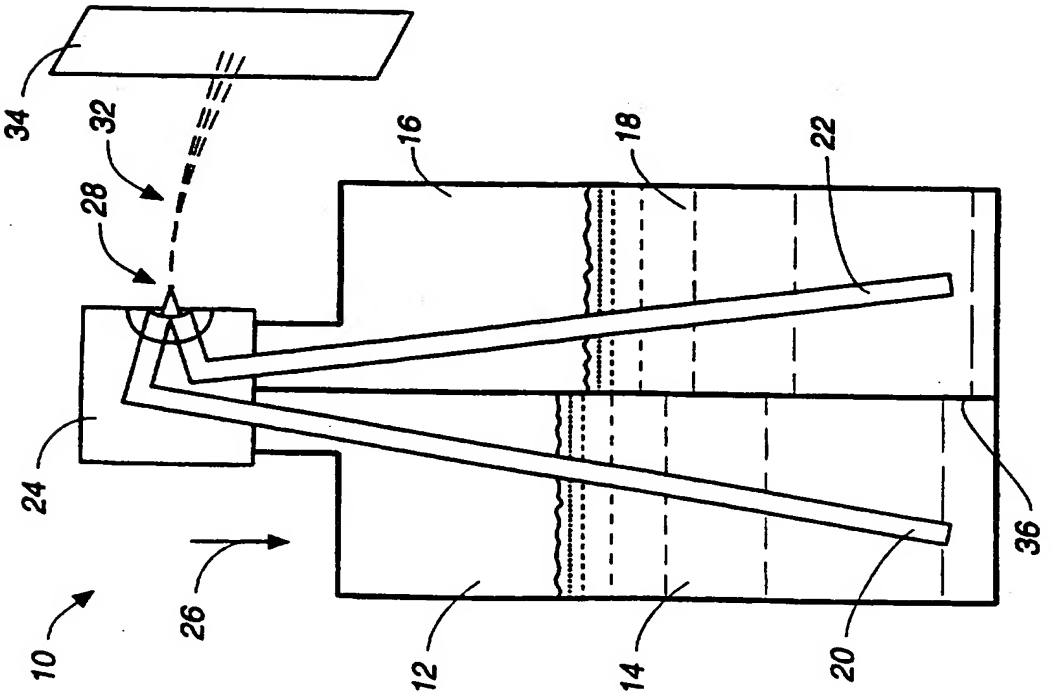

FIG._1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/02587

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :C11D 3/33, 3/395, 7/54

US CL :Please See Extra Sheet.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 510/238, 367, 370, 372, 375, 376, 406, 434, 436, 469, 477, 480, 509; 252/186.38, 186.42, 186.43

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Please See Extra Sheet.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 3,708,431 A (PRUSSIN) 02 January 1973, col. 1, lines 1-10, col. 2, lines 52-57, col. 3, lines 26-34, 50-52, col. 5, lines 36-48, 49-54, col. 6, lines 46-59, Examples 5 and 8.	1, 2, 8, 9, 10, 12, 13, 20-25, 31-33, 35, 36, 43-46 3-7, 14-19, 26-30, 37-42
X Y	WO 95/16023 A (SMITH et al) 15 June 1995, abstract, page 1, lines 8-14, 19-22, page 6, lines 20-26, page 9, lines 2-6, page 10, lines 28-31, page 19, lines 20-24, Example 1.	1-3, 9, 10, 13-18, 20-26, 32, 33, 36-41, 43-46 4-8, 12, 19, 27-31, 35, 42

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search	Date of mailing of the international search report
23 MAY 1997	10 JUL 1997
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer for PAUL LIEBERMAN Telephone No. (703) 308 2523

Form PCT/ISA/210 (second sheet)(July 1992)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/02587

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4,835,804 A (ARNAU-MUNOZ et al) 06 June 1989, col. 2, lines 25-40, col. 9, lines 4-9, 14-22, 46-47.	1-4, 9, 12, 20-27, 32, 42-46
Y	US 4,556,504 A (REK) 03 December 1985, abstract, col. 2, lines 41-46, col. 3, lines 11-20.	10-18, 33-40
A	US 2,973,883 A (MODDERNO) 07 March 1961, see the entire document.	1-46
A	US 3,722,752 A (KENKARE et al) 27 March 1973, see the entire document.	1-46
A	JP 61197696 A (KAO CORP) 01 September 1986, abstract.	1-46
A	JP 02258899 A (MATSUSHITA ELEC IND CO LTD) 19 October 1990, abstract.	1-46

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/02587

A. CLASSIFICATION OF SUBJECT MATTER:
US CL :

510/238, 367, 370, 372, 375, 376, 406, 434, 436, 469, 477, 480, 509; 252/186.38, 186.42, 186.43

B. FIELDS SEARCHED
Electronic data bases consulted (Name of data base and where practicable terms used):

APS,STN
search terms: separately packaged, two or multi or multiple package or container, peroxide, peroxygen, peracid, peracetic, persalt, percarboxylic, peroxymonosulfate, builder, chelant, edta, hydroxide

Form PCT/ISA/210 (extra sheet)(July 1992)*